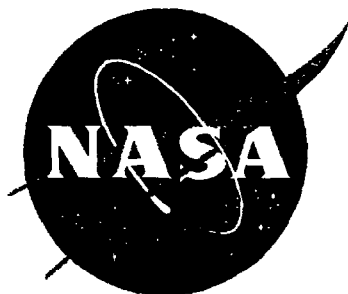


PHASE C/D WORKING AGREEMENT
BETWEEN
JET PROPULSION LABORATORY
AND
GODDARD SPACE FLIGHT CENTER
FOR
DEVELOPMENT OF THE
MICROWAVE LIMB SOUNDER FLIGHT INSTRUMENT
(JPL Task Plan No. 70-5172, Rev. B)
October 2000



———— **GODDARD SPACE FLIGHT CENTER** ————
GREENBELT, MARYLAND

PHASE C/D WORKING AGREEMENT

between

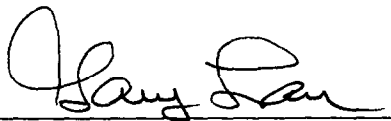
JET PROPULSION LABORATORY

and


GODDARD SPACE FLIGHT CENTER

for

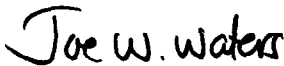
DEVELOPMENT OF THE
MICROWAVE LIMB SOUNDER FLIGHT INSTRUMENT
(JPL Task Plan No. 70-5172, Rev. B, October 2000)



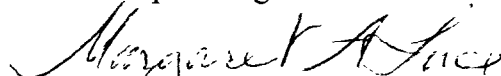
Gary Lau, MLS Project Manager
Jet Propulsion Laboratory



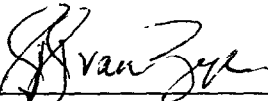
Rajani Cuddapah, MLS Instrument Manager
EOS Aura Project
Goddard Space Flight Center



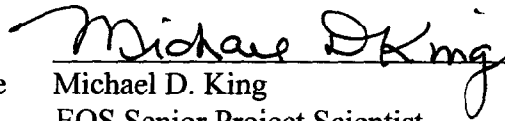
Joe Waters, MLS Principal Investigator
Jet Propulsion Laboratory



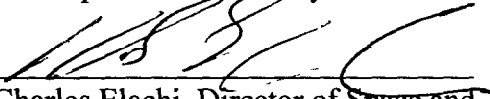
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CHANGE RECORD PAGE

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EOS 420-CM-05 (4/92)

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RELEASE DATE: October 5, 2000

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1. Introduction

This Working Agreement is established between the Jet Propulsion Laboratory (JPL) Microwave Limb Sounder (MLS) Project and the Goddard Space Flight Center (GSFC) Earth Observing System (EOS) Aura Project to set forth the mutually agreed GSFC and JPL responsibilities for MLS instrument development and science investigation.

2. Scope

This Working Agreement covers the development of the MLS flight instrument for the Aura mission. Being added to the Agreement via CH-05 are the two additional UPNs that share JPL's Task Order No. 10025. These additional UPNs cover the science, algorithm development, and flight operations aspects of the MLS experiment up to launch plus 90 days.

3. Applicable Documents

The following documents, or version in effect on the date of this Working Agreement, apply to this Working Agreement in their entirety; non-issued documents listed below will be reviewed at the time of their initial issuance for scope, schedule or cost impact which will then be negotiated into this Working Agreement.

The documents are listed in order of precedence. Specific agreements or custom tailoring of requirements that are satisfactorily negotiated to resolve precedence conflicts will be clearly documented for the record. Other documentation and correspondence will be generated and maintained as required to provide an accurate record of mutually agreeable clarifications and refinements to these documents. Issues related to the MAR, Item #6 will be handled in this manner and are documented in a letter dated April 9, 1998, from the Aura Project Manager and concurred with by the JPL ESFE Program Manager.

1. Earth Observing System (EOS) Chemistry Project Plan, 424-10-01-01, dated April 15, 1999.
2. Documents Requirements List for the MLS, GSFC 424-28-24-03, dated May 26, 1998.
3. Unique Instrument Interface Document (UIID) for the MLS, GSFC 424-28-24-02, April 1998.
4. General Interface Requirements Document (GIRD) for EOS Common Spacecraft/Instruments, GSFC 422-11-12-01, Revision B, August 1998.
5. Interface Control Document (ICD) for the Microwave Limb Sounder (MLS), TRW D26475, July 31, 2000.
6. Mission Assurance Requirements (MAR) for the TES and MLS, GSFC 424-11-13-02, Baseline Document, dated November 13, 1996.
7. Science Requirements on the EOS MLS Instrument and Data Processing Software, JPL D-14421, Revision 2.0, dated September 15, 1999.
8. EOS CSFP Instrument Software Management Requirements Document, GSFC 424-28-11-01, March 31 1995 (Guideline use only).

4. Implementation Responsibility

4.1 Instrument Development

The MLS instrument will be developed in-house at JPL. The instrument will meet the requirements in the Science Requirements on the EOS MLS Instrument (Applicable Document No. 7).

In conducting this effort, JPL shall provide the personnel, materials, services, and facilities required to conceive, design, analyze, fabricate, assemble, test, calibrate and deliver one flight instrument and one set each of associated Ground Support Equipment (GSE), including Mechanical GSE (MGSE) and Electrical GSE (EGSE), and Assembly, Handling, Shipping and storage Equipment (AHSE) for the Aura mission. JPL will also provide to GSFC the technical and management information required for this effort, either as a deliverable item specified in the Documents Requirements List for the MLS or as requested.

JPL will provide technical support and participate in Working Groups for mission interfaces, spacecraft integration and test, calibration, and launch and mission operations as necessary to develop the MLS instrument and coordinate with GSFC for the Aura mission. Following delivery of the instrument, JPL will provide field support at locations to be designated by GSFC for spacecraft integration and test, launch, and in-flight checkout. Field support will be a level-of-effort activity as defined in Paragraph 6. All MLS-provided GSE and AHSE items will be returned to JPL at the completion of spacecraft integration, test, and launch activities.

4.2 Instrument Model Definitions

JPL will design, fabricate and test various units as defined in this section.

4.2.1 Breadboards

JPL will develop and test breadboards of critical components and subsystems as necessary to demonstrate the feasibility and improve the understanding of technologies identified as being high risk and/or having a significant negative impact to the MLS mission in the event of a full or partial failure. JPL will also develop and test breadboards of instrument assemblies as necessary for performance assessments.

4.2.2 Engineering Model

JPL will develop an engineering model instrument that will demonstrate critical technologies. The Engineering Model will consist of two parts -- critical hardware (which is to be tested in a thermal-vacuum chamber) and non-critical hardware (which is to be located in or adjacent to the same thermal-vacuum chamber). The critical hardware includes the radiometer portion of the GHz module, the THz Module, and a Spectrometer Assembly from the Spectrometer Module. The non-critical hardware includes the Antenna Assembly, Power Distribution, C&DH and Harness. Limited emulators will be used for the spacecraft interface and source inputs.

The Engineering Model testing will demonstrate primary instrument operation in an end-to-end systems functionality test, demonstrate critical system functionality, demonstrate assembly procedures, provide an initial, limited demonstration of I&T and calibration procedures, verify electrical and optical interfaces, and demonstrate mechanism functionality. Systems level environmental testing of the engineering model will include thermal vacuum testing at operating temperatures. This system thermal vacuum testing coupled with thermal analysis is to be sufficient to achieve verification of the overall thermal design.

4.2.3 Flight Model

The flight model instrument will be of protoflight quality as defined by the applicable documents.

4.3 Spares

JPL will establish and maintain a spares inventory which ensures a quantity of spare parts and higher level subassemblies appropriate and sufficient to expedite servicing or repair of the instrument.

4.4 Shipping/Storage Container

Storage of the instrument for extended periods may be necessary during spacecraft I&T activities. JPL will provide a securable and environmentally suitable container for instrument storage with devices to monitor the container's internal environment. GSFC will provide for a securable and environmentally suitable area in which to store the container. Storage procedures will be mutually developed between the EOS Aura Project and MLS project.

4.5 Algorithm Development

The science investigation and algorithm development now included covers the development and review in prior fiscal years of the Algorithm Theoretical Basis Documents (as specified in Applicable Document No. 2) and the Science Computing Facility set up to support this work. The cost elements for these efforts have been added to the Working Agreement to make the Task Order current.

JPL will develop and test the set of Level 2 and Level 3 at-launch algorithms for the retrieval of the atmospheric parameters as identified in the Earth Observing System (EOS) Chemistry Project Plan (Applicable Document No. 1). JPL will develop plans and procedures to ensure the integrity of instrument operations on orbit. This effort will include the development and test of Level 1 processing algorithms and associated instrument calibration parameters.

The JPL MLS Science Team will develop plans for data analysis, including plans for producing science results and processing of science data. The JPL MLS Science Team will also support pre-launch and post-launch validation activities as necessary or requested by the Aura Project.

JPL will provide to GSFC the technical and management information required for these efforts, either as a deliverable item specified in the Documents Requirements List for MLS (Applicable Document No. 2) or as requested. JPL will also provide technical support to, and participate in Working Groups for these activities as necessary to coordinate MLS work with the Aura Project Science team.

5. Reviews & Reports

5.1 Reviews

JPL will prepare and present the following formal instrument reviews. (Dates and contents of these reviews will be in accordance with the DRL.)

1. Preliminary Design Review (PDR)
2. Critical Design Review (CDR)
3. Pre-Environmental Review (PER)
4. Pre-Ship Review (PSR)

JPL will also support special instrument status reviews as required, including, but not limited to, Spacecraft-to-Instrument Interface Meetings and Mission Operations Working Group Meetings.

In addition, JPL will provide management reviews for GSFC nominally once each calendar quarter at a time and place to be mutually determined by the GSFC Instrument Manager and the JPL Project Manager.

5.2 Reports

JPL will provide the following periodic reports:

	Report	Period
1.	Written Project Management Report (PMR)	Monthly
2.	Informal Reports (By telephone call or electronic mail)	Weekly

6. Assumptions

The provisions of this Working Agreement are based on several assumptions:

1. GSFC will separately fund, through the Science UPN (229), the science, data processing software, and instrument operations aspects of the MLS experiment after launch plus 90 days.
2. GSFC will provide funding in a timely manner.

3. Carryover obligation authority at the start of a new fiscal year will be sufficient to fund the MLS Project at the required obligation rate until funds for the new fiscal year are on contract at JPL, assumed for planning purposes to be the first 10 weeks of the government fiscal year.
4. Level of effort field support will accommodate the following requirements:
 - a) Spacecraft Integration & Test 10 weeks 3 shifts per day, and
6 weeks of 5 single shift days each,
all at TRW
 - b) Launch site operations 3 weeks 3 shifts per day at
Vandenberg Air Force Base
 - c) 90 day post-launch 4 workmonths over 90 day period
Mission Operations support

If the level of field support required by GSFC exceeds the level identified above, additional funds will be allocated by GSFC to cover the associated costs.

5. An engineering model of the instrument as defined above will be built and tested, but not delivered.
6. The MLS instrument will be developed under JPL institutional requirements as specified by the JPL Space and Earth Science Programs Directorate and will satisfy, as a minimum, the overall quality and reliability requirements of the GSFC Mission Assurance Requirements Document as described in Section 3.0.
7. A Spacecraft-Instrument Interface Simulator (SIIS) will be available to JPL for the EM and PFM on mutually agreeable dates.
8. All flight spare hardware will be available and stored at JPL.
9. Mechanical Ground Support Equipment (Assembly, Handling, storage and Shipping Equipment (AHSE)) and Electrical Ground Support Equipment (EGSE) consisting of Instrument Ground Support Equipment (IGSE) and the IGSE Software and Operating Manual will be provided by JPL and will be available to support spacecraft level integration and test.
10. Deliverable items which are not equipment are listed in the Document Requirements List (DRL) and are therefore, not listed in Section 7.2
11. The Science Requirements on the EOS MLS Instrument (D-14421), Applicable Document 7 in Paragraph 3, will be under JPL change control.

7. Deliverables

JPL and GSFC will support the delivery and receipt of flight and non-flight items in accordance with the following schedule.

7.1 Deliverables from the Aura Project to MLS

All Government Furnished Equipment (GFE) will be accompanied by the appropriate documentation.

	Deliverable	Delivery Date	Quantity
1.	Test kinematic mounts PFM	12/01/00	1 set
2.	Spacecraft-Instrument Interface Simulator (SIIS) available for EM & PF tests	Note 1	1

Note 1: Dates to be mutually determined by the GSFC Instrument Manager and JPL Project Manager.

7.2 Deliverables from MLS to the Aura Project

	Deliverable	Delivery Date	Quantity
1.	Mounting hole drill templates for the GHz, THz and Spectrometer Modules	TBD	1 set
2.	PFM Instrument Acceptance Data Package (DRL Item Number 526)	01/31/02 01/31/02	1 Per DRL
3.	Flight Software Flight Software in EEPROM, PROMs, & FPGAs Instrument Operating Command and Telemetry Data Base Supporting documentation	01/31/02 TBD TBD	1 set 1 1 set
4.	Flight electrical bulkhead connectors with connector savers (spacecraft half of each instrument-to-spacecraft harness connector to be provided to spacecraft provider as flight spare)	01/31/02	1 set
5.	Flight spare hardware (available but not delivered)	N/A	1 set
6.	Mechanical Ground Support Equipment (Assembly, Handling, storage and Shipping Equipment -- AHSE)	01/31/02	1 set
7.	Algorithms for Level 1, 2, and 3 data processing	TBD	1 set

7.3 Logistics

GSFC will establish the logistics guidelines for the exchange of flight and non-flight hardware items between JPL and GSFC at a later date. Fundamental in these guidelines for shipments within the U.S. is that the initiator of a shipment will be solely responsible for the shipment's arrival at its destination. This guideline will apply to both commercial and government bills of lading (GBL) shipments.

8. Schedules

JPL will provide schedules suitable for use by GSFC. These schedules will be in a detail sufficient to monitor progress on a monthly basis.

JPL will implement a scheduling system that provides:

- a. Detailed logic network schedule with horizontal and vertical links available electronically. This network data will include all activities and milestones that identify, end-to-end, all work required to accomplish the objectives of this Working Agreement. It must provide logic for and visibility into the design, manufacturing, integration, and tests through delivery to the spacecraft at a level of detail sufficient for the integration of cost and schedule. Critical paths will be identified in the network.
- b. Gantt-like charts showing selected current milestones, including other activities such as MLS Project internal studies.

JPL and GSFC will mutually determine milestones from the MLS logic networks for use in the Aura Master Project Schedule. These will be considered GSFC reportable milestones in that impending schedule slippage from the latest milestone date will be promptly reported to GSFC. The milestones will include the reviews listed in Section 5.1 and instrument delivery to the spacecraft. Other milestones will be chosen from all subsystems and will cover all years.

9. Resources

9.1 Financial Resources

GSFC will provide funds as specified in the Table 9-1 series of tables which *Profile NOA, Obligation and Cost by UPN*; these funding profiles are integral assumptions of the Working Agreement. The funding shown is consistent with the current best estimates of the funds available to GSFC to conduct the Aura mission; however, both JPL and GSFC recognize the uncertainty of future year funding authority and anticipate re-negotiation of the scope and funding profiles in this Working Agreement if the NOA on the Table 9-1 series are adjusted. The Table 9-2 series of tables are element of cost profiles by UPN.

Table 9-1a Profile of MLS Instrument Development NOA, Obligation and Cost
 All Costs in Millions of Dollars/\$M (UPN 228-12-24)

ITEMS	NAS7-1407 Contract					Runout Totals
	FY'99 Actual	FY'00 Plan	FY'01 Plan	FY'02 Plan	FY'03 Plan	
Cost W/O Reserve	32.0	26.6	10.5	3.1	0.8	120.7
Obligation W/O Reserve	36.9	21.7	10.5	3.1	0.8	120.7
+Carryforward (for next year)	3.2	2.4	0.8	0.2	0.0	6.6
-Carryover (from last year)*	N/A	3.2	2.4	0.8	0.2	6.6
NOA W/O Reserve**	40.0	20.9	8.9	2.5	0.7	120.7
Reserve	N/A	2.0	2.2	0.9	0.1	5.2
Award Fee	1.3	0.3	0.1	0.0	0.0	1.8
NOA †	41.3	23.2	11.2	3.5	0.8	127.7
NOA 5/13/99 Agreement	41.3	21.8	10.4	3.3	0.7	125.2
DELTA	0.0	1.4	0.8	0.2	0.1	2.5
NAS7-1260 Contract	0.0	0.0	0.0	0.0	0.0	47.7
NAS7-1407 Contract	41.3	23.2	11.2	3.5	0.8	80.0
Contractual Estimated Cost	41.3	23.2	11.2	3.5	0.8	127.7
* Carryover obligation authority at the start of a new fiscal year will be sufficient to fund the MLS Project at the required obligation rate until funds for the new fiscal year are on contract at JPL, assumed for planning purposes to be the first ten weeks of the government fiscal year.						
** NOA W/O Reserve is calculated as follows: planned current year obligation + carryover (to) - carryover (from)						
† The funding shown is consistent with the implementation plan which forms the basis for this Task Plan. However, both JPL and GSFC recognize the uncertainty of future year funding authority and would anticipate re-negotiation of the scope of the implementation plan and funding profiles in this Task Plan if the NOA is adjusted. In addition, obligation authority actually provided to JPL in each fiscal year will be assessed and adjusted based upon actual cost performance during each fiscal year.						

Table 9-2a Profile of MLS Instrument Development Costs

All Costs in Millions of Dollars/\$M (UPN 228-12-24)

ITEMS	PY's	FY'00	FY'01	FY'02	FY'03	TOTAL
DESCRIPTION	Actual	Plan	Plan	Plan	Plan	Plan
Workforce (YRS)	230	66	36	12	5	349
Labor Cost	20.2	6.4	2.7	0.9	0.4	30.6
Travel	0.6	0.3	0.1	0.0	0.0	1.0
Services	6.2	4.2	2.7	0.2	0.0	13.3
Procurements	37.4	12.5	3.3	2.0	0.2	55.4
Total Direct Costs	64.4	23.4	8.8	3.1	0.6	100.3
Burden Costs	15.3	5.1	3.9	0.9	0.4	25.6
Total JPL Costs	79.7	28.5	12.7	4.0	1.0	125.9
Award Fee	1.3	0.3	0.2	0.0	0.0	1.8
Total Cost to NASA	81.0	28.9	12.8	4.0	1.0	127.7

Table 9-1b Profile of MLS Science/CalVal NOA, Obligation and Cost

All Costs in Millions of Dollars/\$M (UPN 229-07-24)

ITEMS		NAS7-1407 Contract					Runout Totals
		FY'99 Actual	FY'00 Plan	FY'01 Plan	FY'02 Plan	FY'03 Plan	
Cost		3.9	4.5	4.5	5.4	6.2	29.8
Obligation		4.0	4.4	4.5	5.4	6.2	29.8
+Carryforward (for next year)		0.6	0.8	1.0	0.7	0.0	3.1
-Carryover (from last year)*		N/A	0.6	0.8	1.0	0.7	3.1
NOA		4.6	4.6	4.7	5.1	5.5	29.8
Award Fee		0.3	0.1	0.1	0.1	0.1	0.7
NOA †		4.9	4.7	4.8	5.2	5.6	30.5
NOA 3/21 King G/L's		4.9	4.7	4.8	5.2	5.6	30.5
DELTA		0.0	0.0	0.0	0.0	0.0	0.0
NAS7-1260 Contract		0.0	0.0	0.0	0.0	0.0	5.3
NAS7-1407 Contract		4.9	4.7	4.8	5.2	5.6	25.2
Contractual Estimated Cost		4.9	4.7	4.8	5.2	5.6	30.5

* Carryover obligation authority at the start of a new fiscal year will be sufficient to fund the MLS Project at the required obligation rate until funds for the new fiscal year are on contract at JPL, assumed for planning purposes to be the first ten weeks of the government fiscal year.

† The Science/CalVal and SCF funding shown is consistent with the yearly guideline direction provided by M. D. King, EOS Senior Project Scientist, which forms the basis for this Task Plan. However, both JPL and GSFC recognize the uncertainty of future year funding authority and would anticipate re-negotiation of the scope and funding profiles in the Task Plan if the NOA is adjusted. In addition, obligation authority actually provided to JPL in each fiscal year will be assessed and adjusted based upon actual cost performance during each fiscal year.

Table 9-2b Profile of MLS Science/CalVal Costs

All Costs in Millions of Dollars/\$M (UPN 229-07-24)

ITEMS	PY's	FY'00	FY'01	FY'02	FY'03	TOTAL
DESCRIPTIION	Actual	Plan	Plan	Plan	Plan	Plan
Workforce (YRS)	58	23	26	25	27	159
Labor Cost	5.0	2.4	2.7	2.7	3.2	16.0
Travel	0.1	0.0	0.0	0.0	0.0	0.1
Services	0.8	0.1	0.0	0.0	0.0	0.9
Procurements	0.6	0.6	0.2	1.1	1.1	3.6
Total Direct Costs	6.5	3.1	2.9	3.8	4.3	20.7
Burden Costs	2.7	1.4	1.6	1.6	1.8	9.1
Total JPL Costs	9.2	4.5	4.5	5.4	6.1	29.8
Award Fee	0.3	0.1	0.1	0.1	0.2	0.7
Total Cost to NASA	9.5	4.6	4.6	5.5	6.3	30.5

Table 9-1c Profile of MLS SCF NOA, Obligation and Cost

All Costs in Millions of Dollars/\$M (UPN 229-07-74)

ITEMS		NAS7-1407 Contract					Runout Totals
		FY'99 Actual	FY'00 Plan	FY'01 Plan	FY'02 Plan	FY'03 Plan	
Cost	1.6	0.7	1.4	1.2	1.4	1.4	7.7
Obligation		0.7	1.4	1.2	1.4	1.4	7.7
+Carryforward (for next year)		0.5	0.8	0.9	0.9	0.0	3.1
-Carryover (from last year)*		N/A	0.5	0.8	0.9	0.9	3.1
NOA	1.3	1.2	1.0	1.2	1.4	1.4	7.8
Award Fee		0.0	0.0	0.0	0.1	0.0	0.1
NOA †	1.6	1.2	1.0	1.2	1.5	1.4	7.9
NOA 3/21 King G/L's	0.0	1.2	1.0	1.2	1.5	1.4	7.9
DELTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NAS7-1260 Contract	1.6	0.0	0.0	0.0	0.0	0.0	1.6
NAS7-1407 Contract	0.0	1.2	1.0	1.2	1.5	1.4	6.3
Contractual Estimated Cost	1.6	1.2	1.0	1.2	1.5	1.4	7.9
<p>* Carryover obligation authority at the start of a new fiscal year will be sufficient to fund the MLS Project at the required obligation rate until funds for the new fiscal year are on contract at JPL, assumed for planning purposes to be the first ten weeks of the government fiscal year.</p>							
<p>** NASA7-1260 Contract PY Actuals includes UPN 229-71-24 with NOA, Obligation and Cost actuals totalling \$1.6M</p>							
<p>† The Science/CalVal and SCF funding shown is consistent with the yearly guideline direction provided by M. D. King, EOS Senior Project Scientist, which forms the basis for this Task Plan. However, both JPL and GSFC recognize the uncertainty of future year funding authority and would anticipate re-negotiation of the scope and funding profiles in the Task Plan if the NOA is adjusted. In addition, obligation authority actually provided to JPL in each fiscal year will be assessed and adjusted based upon actual cost performance during each fiscal year.</p>							

Table 9-2c Profile of MLS Science Computing Facility (SCF) Costs
All Costs in Millions of Dollars/\$M (UPN 229-07-74)

ITEMS	PY's	FY'00	FY'01	FY'02	FY'03	TOTAL
DESCRIPTION	Actual	Plan	Plan	Plan	Plan	Plan
Workforce (YRS)	2	2	2	2	2	10
Labor Cost	0.9	0.1	0.2	0.2	0.3	1.7
Travel	0.0	0.0	0.0	0.0	0.0	0.0
Services	0.3	0.0	0.0	0.0	0.0	0.3
Procurements	0.4	1.1	0.8	1.0	0.9	4.2
Total Direct Costs	1.6	1.2	1.0	1.2	1.2	6.2
Burden Costs	0.7	0.2	0.2	0.2	0.2	1.5
Total JPL Costs	2.3	1.4	1.2	1.4	1.4	7.7
Award Fee	0.1	0.0	0.0	0.1	0.0	0.2
Total Cost to NASA	2.4	1.4	1.2	1.5	1.4	7.9

Table 9-1d Profile of MLS TOTAL PROJECT NOA, Obligation and Cost

All Costs for Instrument, Science/CalVal, and SCF, \$M (All UPN's)

ITEMS		NAS7-1407 Contract					Runout Totals
		FY'99 Actual	FY'00 Plan	FY'01 Plan	FY'02 Plan	FY'03 Plan	
Cost W/O Reserve		36.4	32.6	16.2	9.9	8.4	158.1
Obligation W/O Reserve		41.5	27.5	16.2	9.9	8.4	158.1
+Carryforward (for next year)		4.3	4.1	2.7	1.7	0.0	12.8
-Carryover (from last year)*		N/A	4.3	4.1	2.7	1.7	12.8
NOA W/O Reserve**		45.8	26.5	14.7	9.0	7.5	158.1
Reserve (Instrument Only)		N/A	2.0	2.2	0.9	0.1	5.2
Award Fee		1.7	0.5	0.2	0.2	0.2	2.8
NOA †		47.5	29.0	17.1	10.1	7.8	166.1
NOA Agreements / G/L's		47.5	27.6	16.4	9.9	7.7	163.7
DELTA		0.0	1.4	0.7	0.2	0.1	2.4
NAS7-1260 Contract		0.0	0.0	0.0	0.0	0.0	54.6
NAS7-1407 Contract		47.5	29.0	17.1	10.1	7.8	111.5
Contractual Estimated Cost		47.5	29.0	17.1	10.1	7.8	166.1
<p>* Carryover obligation authority at the start of a new fiscal year will be sufficient to fund the MLS Project at the required obligation rate until funds for the new fiscal year are on contract at JPL, assumed for planning purposes to be the first ten weeks of the government fiscal year.</p>							
<p>** NOA W/O Reserve is calculated as follows: planned current year obligation + carryover (to) - carryover (from)</p>							
<p>*** NASA7-1260 Contract PY Actuals includes UPN 229-71-24 NOA, Obligation and Cost actuals totalling \$1.6M</p>							
<p>† The funding shown is consistent with the implementation plan which forms the basis for this Task Plan. However, both JPL and GSFC recognize the uncertainty of future year funding authority and would anticipate re-negotiation of the scope of the implementation plan and funding profiles in this Task Plan if the NOA is adjusted. In addition, obligation authority actually provided to JPL in each fiscal year will be assessed and adjusted based upon actual cost performance during each fiscal year.</p>							
<p>† The Science/CalVal and SCF funding shown is consistent with the yearly guideline direction provided by M. D. King, EOS Senior Project Scientist, which forms the basis for this Task Plan. However, both JPL and GSFC recognize the uncertainty of future year funding authority and would anticipate re-negotiation of the scope and funding profiles in the Task Plan if the NOA is adjusted. In addition, obligation authority actually provided to JPL in each fiscal year will be assessed and adjusted based upon actual cost performance during each fiscal year.</p>							

Table 9-2d Profile of MLS TOTAL PROJECT Costs
All Costs for Instrument, Science/CalVal, and SCF, \$M (All UPN's)

ITEMS	PY's	FY'00	FY'01	FY'02	FY'03	TOTAL
DESCRIPTION	Actual	Plan	Plan	Plan	Plan	Plan
Workforce (YRS)	290	91	64	39	34	518
Labor Cost	26.1	8.9	5.6	3.8	3.9	48.3
Travel	0.7	0.3	0.1	0.1	0.0	1.2
Services	7.3	4.3	2.7	0.2	0.0	14.6
Procurements	38.4	14.2	4.3	4.1	2.2	63.2
Total Direct Costs	72.5	27.7	12.7	8.1	6.1	127.1
Burden Costs	18.7	6.7	5.7	2.8	2.3	36.2
Total JPL Costs	91.2	34.4	18.4	10.9	8.4	163.3
Award Fee	1.7	0.5	0.2	0.2	0.2	2.8
Total Cost to NASA	92.9	34.9	18.6	11.1	8.6	166.1

The funds are divided into two categories:

- 1) NOA/Obligation/Cost Plan Funds -- covers the work effort as defined in this Working Agreement and understood on the date of this Working Agreement.
- 2) Reserve Funds -- covers problem resolution, rework, underestimates, overhead rate changes, and MLS-initiated scope changes that could not be identified at the time of this Working Agreement.

JPL will hold management reserve for the MLS instrument development as shown in Tables 9-1 and 9-1a. The MLS project will establish a management reserve tracking system that will identify liens and encumbrance of this reserve and will provide detailed reporting to GSFC.

In managing this effort, JPL will not rely exclusively on reserve funds to solve all cost problems. JPL will periodically identify descope options which could be taken to reduce costs or re-gain schedule. Identified descope options will be presented at PDR, CDR, and PER. JPL and GSFC will jointly decide if and when any of these descope options will be implemented.

JPL will use reserve funds to cover any negotiated increase in scope initiated by JPL/MLS. However, JPL will receive additional funding to cover any significant increases in scope initiated by NASA/GSFC/EOS-Aura Project. Changes initiated by JPL that impact the Spacecraft will be presented to GSFC for review and concurrence, and the associated spacecraft costs will be paid for by MLS. The point of reference for such changes will be the UIID baseline (Applicable Document No.3). Periodic reviews may be held by GSFC to assess the availability of prior year unused reserves for reallocation.

JPL will inform GSFC on a monthly basis of JPL's funding status with respect to actual cost performance and outstanding obligations, including use of reserve.

JPL and GSFC will jointly work to minimize uncosted funding at the end of each FY. Specifically, at the end of each FY:

1. JPL will so develop its obligation and cost plan that it will carry forward uncosted funding to cover funding needs (workforce, travel, services, etc.) of only the first 10 weeks of the government fiscal year.
2. JPL contracts in force at a fiscal year boundary will be so planned and managed that incremental funding available to the contractor will extend for no more than 90 days beyond the start of the new government fiscal year.
3. As necessary and feasible within technical and schedule constraints, JPL will:
 - Minimize obligations for new procurements during the first 10 weeks of the government fiscal year.
 - Move planned future year work into the current year to recover under-costing of the cost plan.
 - Move planned current year work into future years to recover over-costing of the cost plan.

In addition, at the end of the third fiscal quarter of each year, GSFC and JPL will jointly evaluate the MLS Project fiscal needs and cost performance through the first three quarters with the intent of adjusting (decreasing or increasing) the NOA available to the Project to minimize uncosted funds as outlined above while still maintaining schedule commitments.

9.2 Technical Resources

JPL will track, and regularly report to GSFC, mass, power and data rate resources allocated to the instrument with a current best estimate (CBE), associated uncertainty, and available reserves (margin) at the instrument level and at lower level assemblies. JPL will maintain minimum resource reserves in addition to CBE and uncertainty, which will be of a size that decreases as the design matures; GSFC and JPL will mutually determine this profile of reserve vs. time. Options to reduce required resources will be developed, maintained and regularly reported at reviews with GSFC with the intent that they be exercised to such extent as may be necessary to maintain the required reserve.

10. Points of Contact

The GSFC Instrument Manager and the JPL Project Manager will be the single point of contact within their respective organizations for the coordination, negotiation and resolution of programmatic requirements and issues between JPL and GSFC for instrument development. The JPL EOS MLS Principal Investigator will coordinate the scientific aspects of his investigation with the EOS Aura Project Scientist at GSFC.

11. Period of Performance

The period of performance for this Working Agreement will be from the date of signing to launch plus 90 days; this Working Agreement is based on an instrument delivery date of 01/31/02 and a launch readiness date of 12/01/02.

12. Changes to this Agreement

Subsequent to acceptance and signing of this Working Agreement by the responsible parties, the Working Agreement may be changed or amended at any time with the bilateral agreement of the MLS Project and the EOS Aura Project. The EOS Aura Project configuration control system, established by EOS Aura Project in accordance with the EOS Configuration Management Plan (420-02-02), will be used as a vehicle for processing such changes in an orderly manner.

ACRONYMS AND ABBREVIATIONS

AHSE	Assembly, Handling, Shipping and storage Equipment
C&DH	Command and Data Handling
CDR	Critical Design Review
CHEM	Chemistry (Project or Mission)
DRL	Document Requirements List
EEPROM	Electrically Erasable PROM
EGSE	Electrical GSE
EM	Engineering Model
EOS	Earth Observing System
ESFE	Earth Science Flight Experiments
FPGA	Field Programmable Gate Array
GBL	Government Bills of Lading
GFE	Government Furnished Equipment
GIRD	General Interface Requirements Document
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
I&T	Integration and Test
ICD	Interface Control Document
IGSE	Instrument Ground Support Equipment
JPL	Jet Propulsion Laboratory
MAR	Mission Assurance Requirements
MGSE	Mechanical GSE
MLS	Microwave Limb Sounder
NASA	National Aeronautics and Space Administration
NOA	New Obligation Authority
PDR	Preliminary Design Review
PER	Pre Environmental Review
PFM	Protoflight Model
PMR	Project Management Report
PROM	Programmable Read Only Memory
PSR	Pre Ship Review
SCR	System Concept Review
SIIS	Spacecraft-Instrument Interface Simulator
TBD	To Be Determined
TES	Tropospheric Emission Spectrometer
UIID	Unique Instrument Interface Document
UPN	Unique Project Number